

Water Isotope Ratio Infrared Spectrometer *Iris*

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Water Isotope Ratio Infrared Spectrometer *Iris*

Project History

Cavity Enhanced Spectroscopy

DC-8 Results

WB-57 Integration

Outlook

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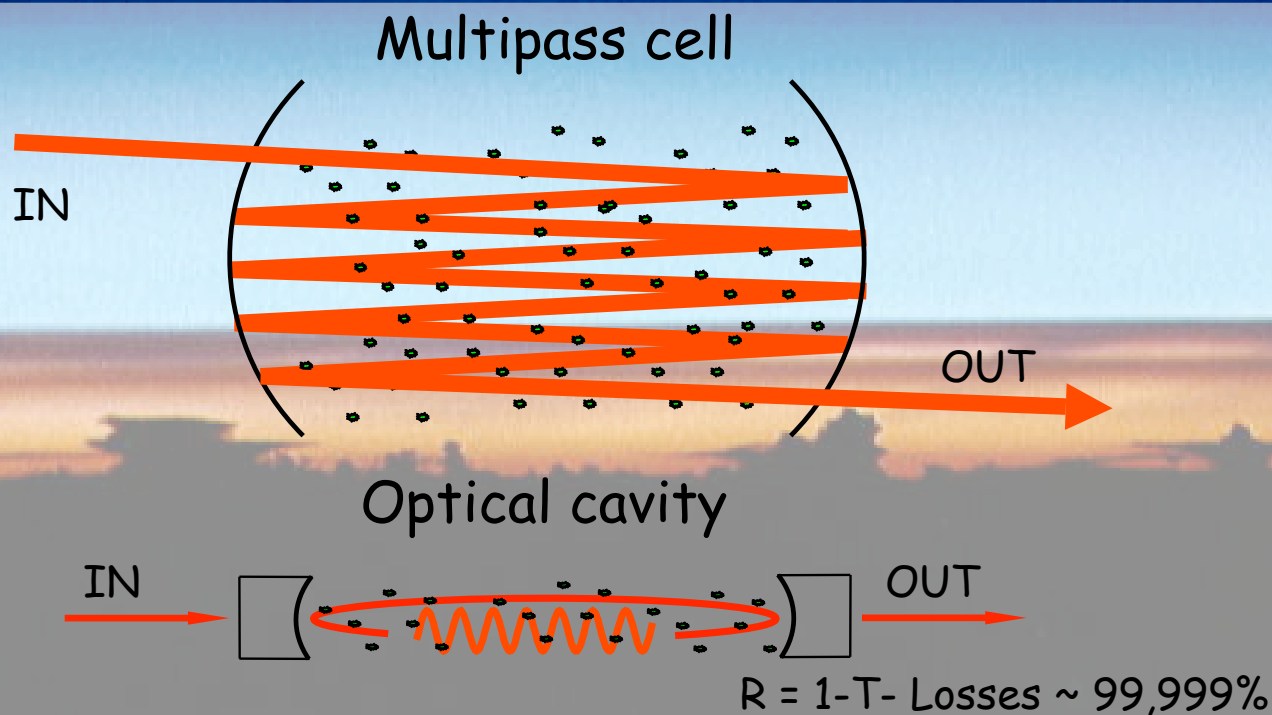
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History

- 1999: Dutch NSF research proposal granted
Whole air sampler with laser based analysis in lab
- 2001: Redefined as in-situ analyzer
- Jan 2003: Ph.D student Rosario Iannone started
- Feb 2003: collaboration with Grenoble initiated (OF-CEAS)
- Jun 2003: collaboration with Ames (access to NASA DC-8 assured)
- May 2004: First successful test flights on NASA's DC-8

Cavity enhanced

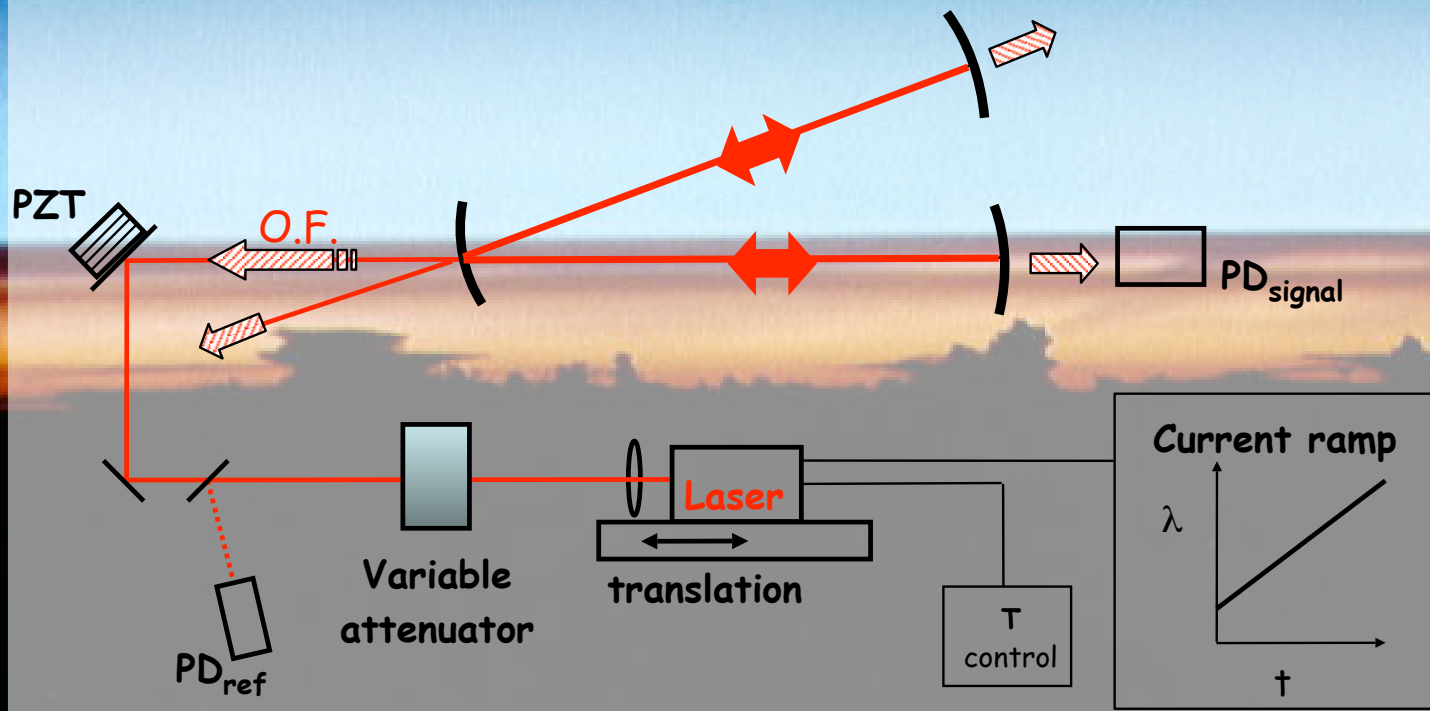


100 x more passes + 100 x less volume !

10ml/(1 liter/min) -> 0.6s sample exchange time...

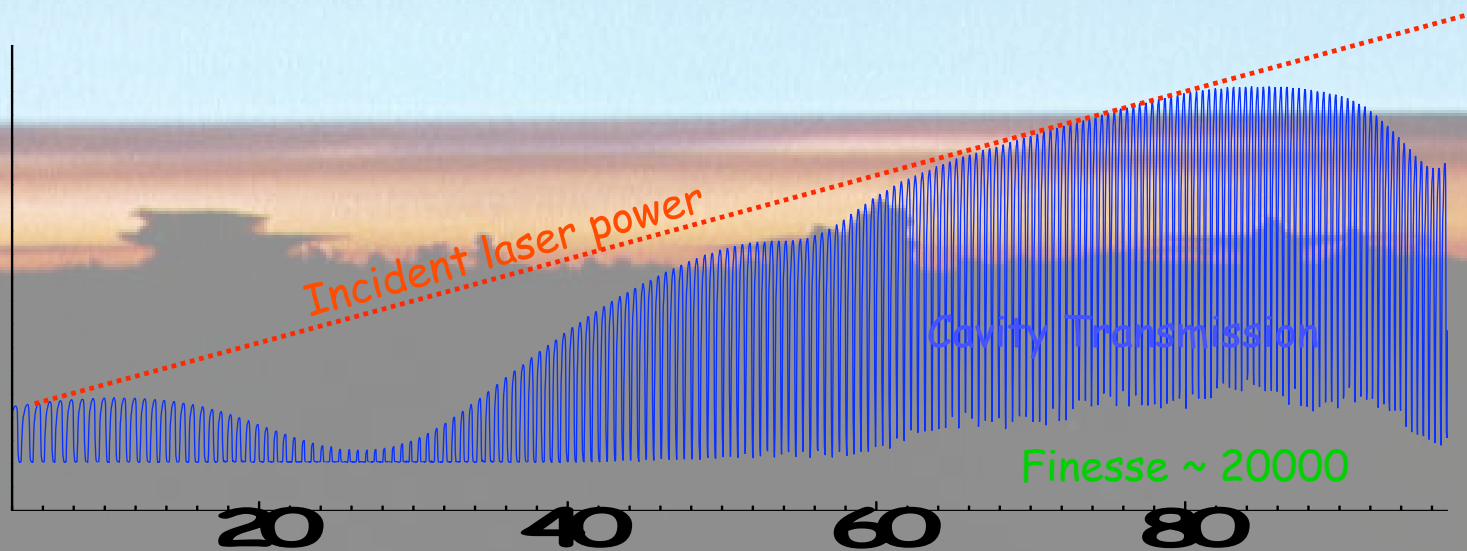
OF-CEAS

Grenoble



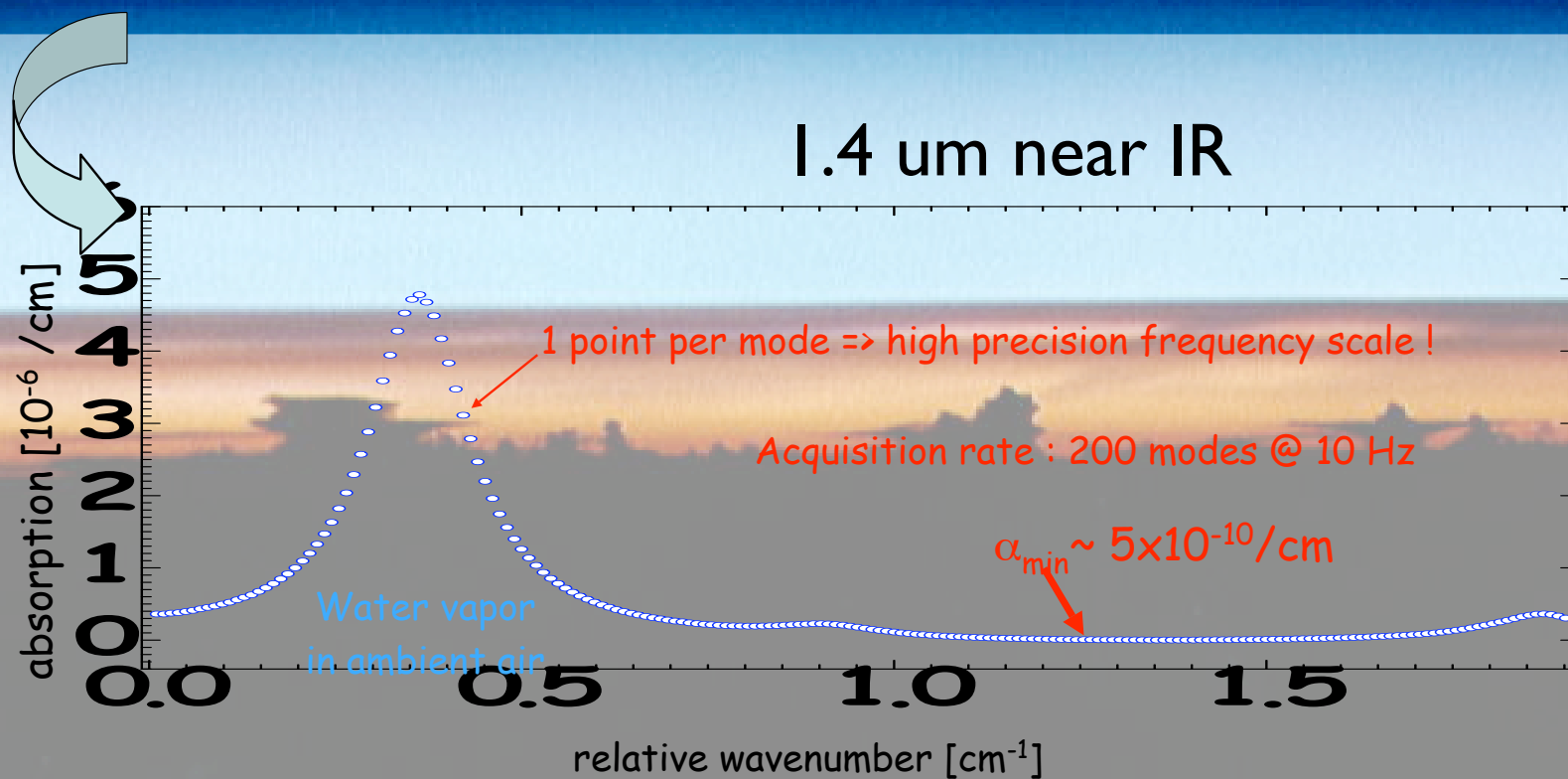
OF-CEAS

Grenoble



OF-CEAS

Grenoble



DC-8 Results

May 2004



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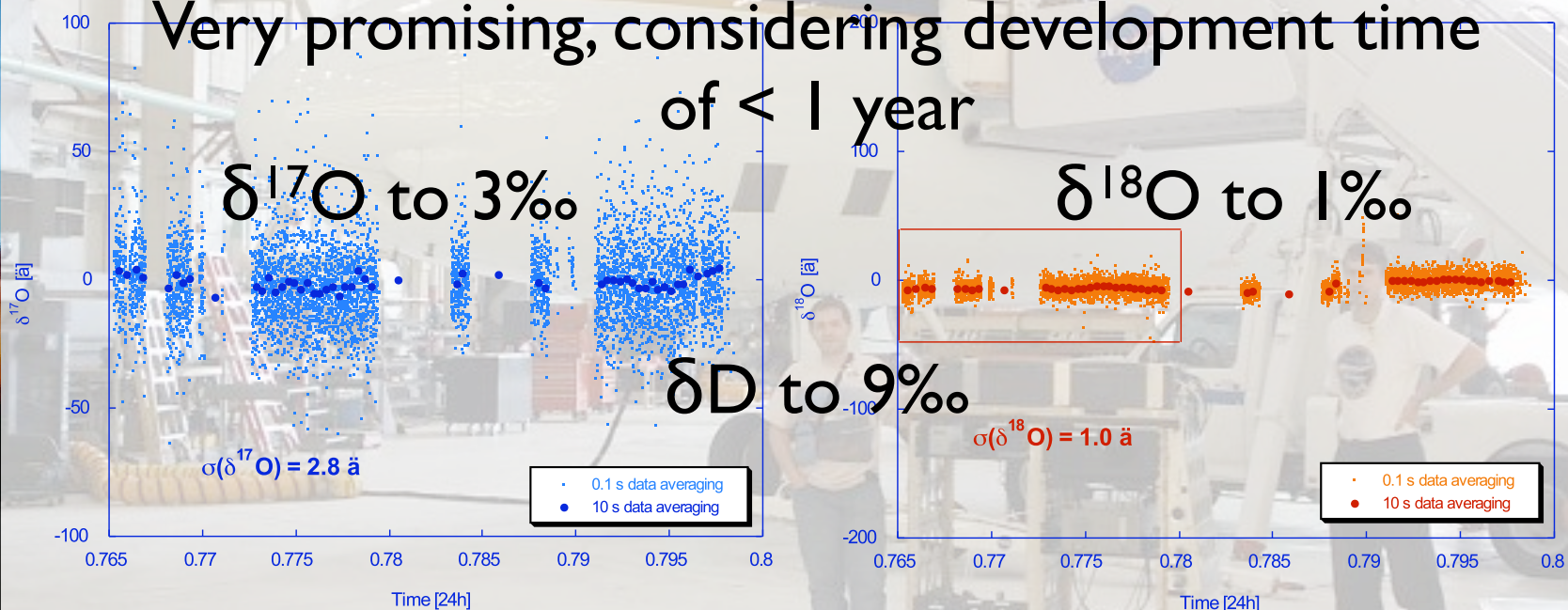
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DC-8 Results

May 2004

Very promising, considering development time
of < 1 year



Assuming water vapor conditions are constant during level flight at 13 km, the measurement precision amounts to about 9‰ for $\delta^2\text{H}$, 3‰ for $\delta^{17}\text{O}$, while $\delta^{18}\text{O}$ shows an amazing 1.0‰ during a particularly quiet section (~200ppm).

WB-57 integration

Mar 28, 05: selection for Isotope Intercomparison
start of WB-57 integration

- design and build inlet
- acquire flight computer and integration with *Iris*
- new detectors
- new laser electronics
- new breadboard

WB-57 integration

June 6, 05: first time parts from 4 labs spread over 9 time zones came together

June 11, 05: first engineering flight during AVE

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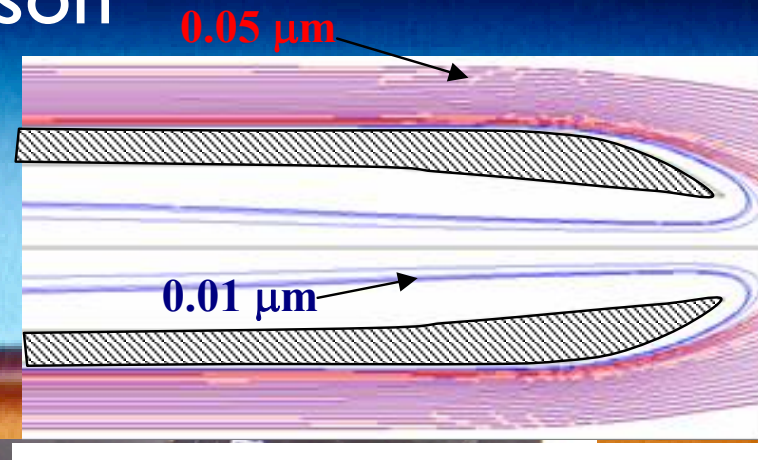
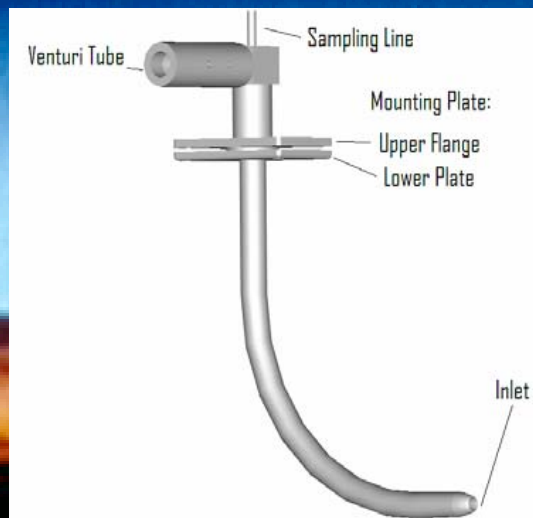
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Particle rejecting inlet

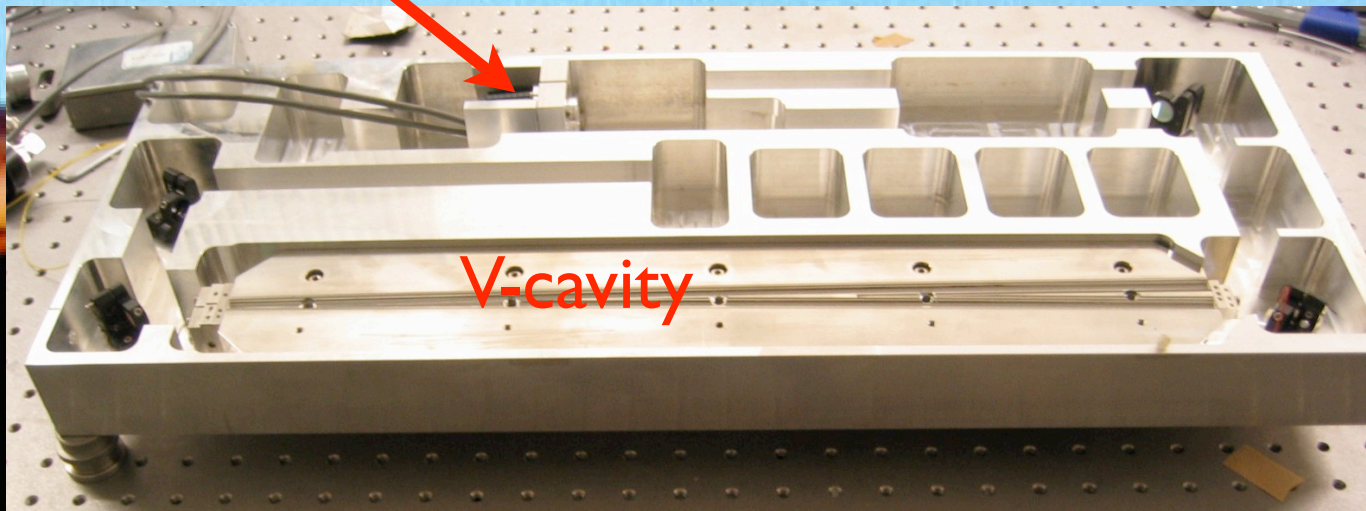
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Bread Board

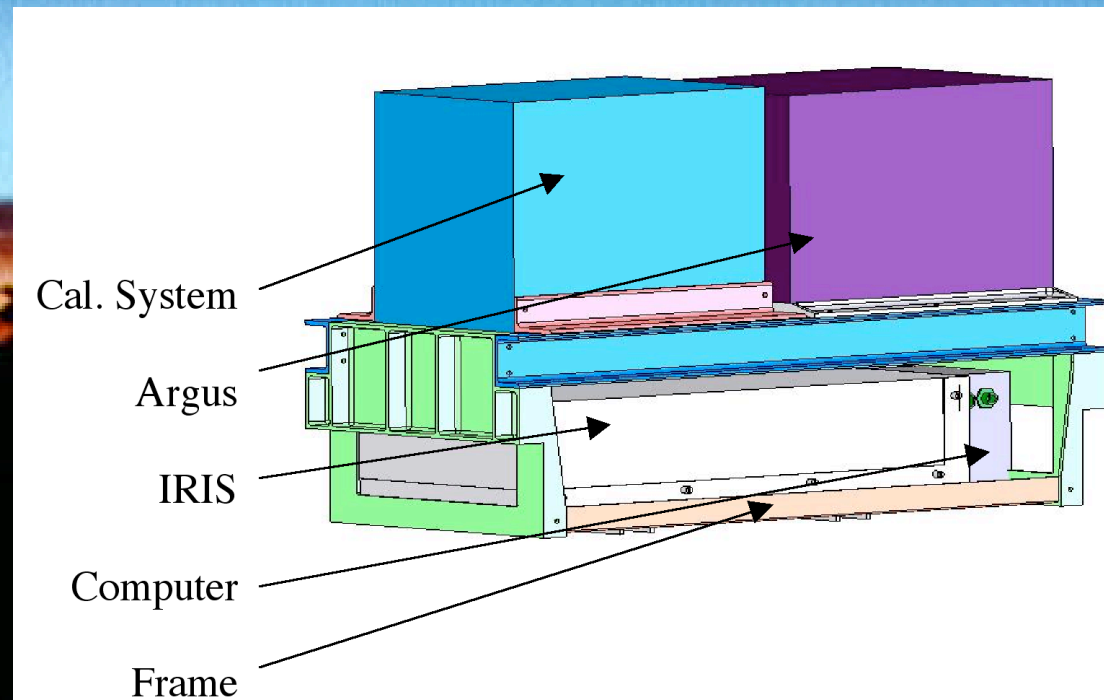
Groningen/Grenoble

Laser



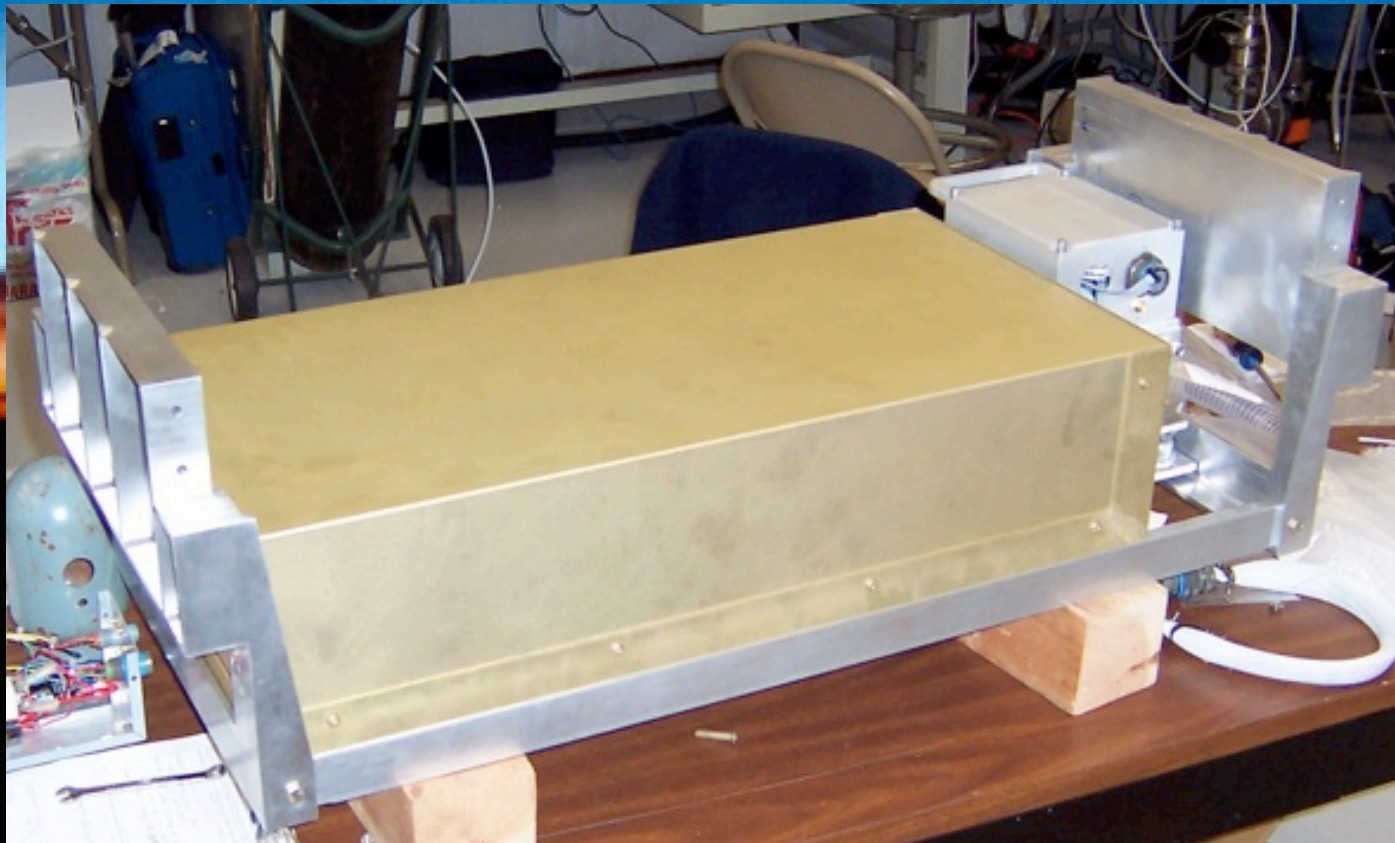
Integration under Argus

NASA Ames/BAERI



Shroud/Computer

NASA Ames/BAERI



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Results

- Instrument performed well thermally (no overheating on the ground)
- inlet flows are largely as expected
- community exhaust shows substantial pressure fluctuations
 - influences our sample flow
- new laser electronics performed well
- recovered from many problems due to short build time

Issues

- commercial pressure controller failed, so did spare
- Minco temperature controller burned out
- aircraft standards

Outlook

- working with manufacturers to fix controllers (sloooow!)
- investigating replacement
- pressure chamber tests
- plan to piggy back in November 05 time frame to demonstrate capabilities

Summary

- Iris is a near-IR, gas phase, water isotope instrument calibrated at CIO Groningen
- small, shares space with Argus
- mechanically and thermally fine
- inlet shows expected flows
- not recoverable problems with commercial controllers
- hope to contribute to CRAVE

Acknowledgments

PARTICIPANT	AFFILIATION	HOUSTON DEPLOYMENT
Mr. Henk Been *	University of Groningen	
Mr. Bruce Borchers *	BAERI	
Dr. Marc Chenevier	University of Grenoble	June 5 – June 26
Dr. Suresh Dhaniyala	Clarkson University	June 5 – June 12
Mr. Patrick Eddy	Clarkson University	June 5 – July 9
Dr. Hans-Jürg Jost	NASA Ames / BAERI	June 6 – June 11, June 25 – July 9
Mr. Rosario Iannone (PhD, this project)	University of Groningen	June 5 – July 9
Dr. Samir Kassi *	University of Grenoble	
Dr. Erik Kerstel	University of Groningen	June 24 – July 2
Dr. Daniele Romanini	University of Grenoble	
Dr. Marcel Snels	University of Groningen	June 5 – June 12
Mr. James Terman *	BAERI	June 6 - June 11, June 20 – July 8

funding from NASA UARP, RSP and European Agencies
WB-57 crew and pilots

RUG

